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SURVIVAL OF RODENT CACHED BITTERBRUSH SEED^{1/}

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ABSTRACT: Seedlings and young plants of antelope bitterbrush are generally scarce in northeastern California, but in the spring of 1960 a large flush of seedlings emerged from seed in rodent caches. Seedlings that had to compete with the native vegetation and cheatgrass failed to survive. Where competing vegetation had been removed, survival was excellent.

Antelope bitterbrush (Purshia tridentata), a primary winter deer browse plant in the West, is not reproducing on winter deer ranges in northeastern California. Existing stands are becoming decadent and non-productive of browse. For example, on one such deer range about 5 miles north of Doyle, Lassen County, California, bitterbrush reproduction was checked for 9 years before more than an occasional seedling was found.

The Doyle area is a desert shrub site (fig. 1). Annual precipitation averages 9.55 inches and falls mostly during winter and early spring. The principle overstory vegetation is bitterbrush, desert peach (Prunus andersonii), and sagebrush (Artemisia spp.). The understory is mostly a dense stand of cheatgrass (Bromus tectorum); perennial grasses and forbs make up only a minor part of the understory. The soil is a gravelly, coarse sandy loam, with deep drainage and very little runoff.

^{1/} Contribution from cooperative investigations between the Pacific Southwest Forest and Range Experiment Station and the California Department of Fish and Game. Work was done under Federal Aid in Wildlife Restoration Act, Pittman-Robertson Research Project W51R entitled "Game Range Restoration."

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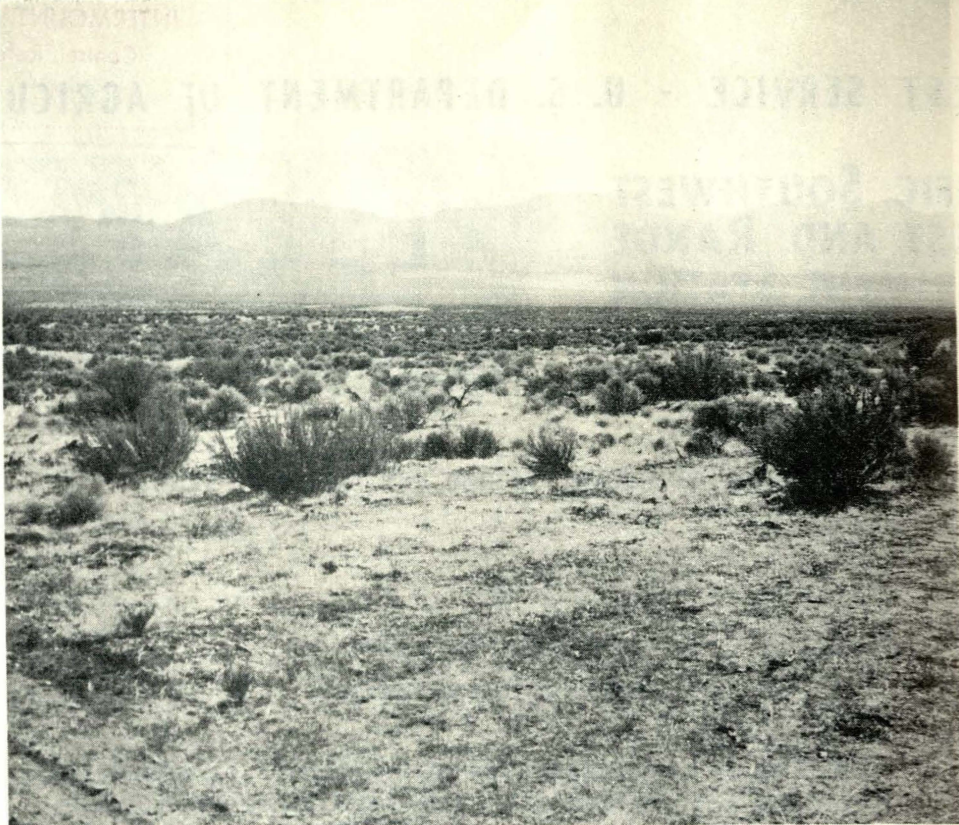


Figure 1.--General view of the desert shrub site near Doyle, California.

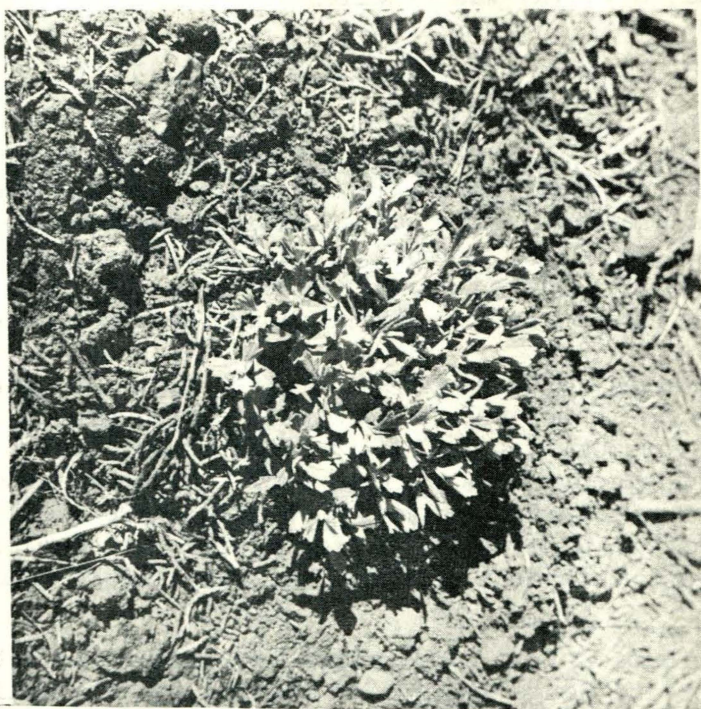


Figure 2.--A typical view of bitterbrush seedlings emerging from a rodent seed cache.

In 1960, large numbers of bitterbrush seedlings emerged. These seedlings came from rodent seed caches, the most common way for bitterbrush seed to be planted in nature.^{2/} Each seed cache produced from 1 to 25 seedlings (fig. 2). Altogether, there were about 1,300 groups of seedlings per acre.

By September 1960, few of the groups had any surviving seedlings where the understory was undisturbed. Of 25 seed caches checked in September, only 4 percent had at least one seedling surviving. Rodents, rabbits, and insects killed a few bitterbrush seedlings but this damage was insignificant. No livestock grazed the area, and deer use was light.

However, in an area rototilled each year from 1955 through 1959 and weeded in 1960 after bitterbrush seedling emergence, 88 percent of these rodent seed caches had live seedlings even though precipitation at Doyle was only 75 percent of average. Therefore, we attributed the heavy mortality of bitterbrush in the undisturbed vegetation to increased competition for moisture.

In Idaho, Holmgren^{3/} found that cheatgrass was one of the most aggressive competitors with bitterbrush seedlings. It could be that this relatively recent addition to the flora of northeastern California has created more severe competition for the available moisture than existed when the present bitterbrush stands were established.

We cannot explain why 1960 was a good bitterbrush seedling year. The 1959 seed crop was adequate but not exceptional. The 1959-1960 precipitation season was the second drought year in a row, but the soil apparently had enough moisture for good bitterbrush seed germination and seedling emergence. One reason for good emergence may be that the rodent population decreased during the winter and fewer animals were present in the spring to dig up and eat the seed, but this is only a guess.

Natural reproduction of bitterbrush requires conditions that result in good emergence and adequate soil moisture during the period of seedling establishment. Adequate soil moisture can be maintained either by more precipitation than was received in the 1959-1960 season or by reduced plant competition. Conditions for emergence and survival apparently have not coincided for the past 10 years at Doyle since there has not been significant seedling establishment. Obviously these conditions have coincided in the past--otherwise the present bitterbrush stands would not be present. Development of methods to reduce cheatgrass competition may be the best chance to aid natural establishment of bitterbrush seedlings on sites having low precipitation.

^{2/} Hormay, August L. Bitterbrush in California. U.S. Forest Serv. Calif. Forest & Range Expt. Sta., Forest Res. Note 34, 13 pp., illus. 1943.

^{3/} Holmgren, Ralph C. Competition between annuals and young bitterbrush (Purshia tridentata) in Idaho. Ecology 37:370-377. 1956.